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RECORDS OF FISHES FOR THE EASTERN AND SOUTHERN  
UNITED STATES.

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The present paper is a report on the collections obtained for the Academy, chiefly during 1921. The materials and notes for the Middle Atlantic States are given first. They contain some interesting and unusual items of more local distribution. It is, however, chiefly in the streams of the Southern Alleghanies that the greater results were gathered. These were largely from collections made by the writer with Mr. Edwin Fowler, for the Fowler-Academy Expedition of October 1921. Eight rare or little-known species were rediscovered. The American Museum of Natural History in New York City, through Mr. John T. Nichols, very kindly submitted the collections made in Virginia and North Carolina by Mr. E. R. Dunn. As they contain two very interesting species, they are noted accordingly. A duplicate set of specimens had been generously donated to the Academy for the services rendered in the study of this material. Ten figures, representing the rare species hitherto unfigured, are given.

NEW YORK.

During the summer Mr. George W. Goudy sent the following fishes from Indian Lake in the Adirondacks.

*Calostomus commersonnii* (Lacépède). The largest of four males, is 200 mm. long. Scales 62 in lateral line to caudal base and 4 more on latter. The lower half of the caudal and all the anal rays tuberculate. This evidently represents the nominal *C. utawana* Mather, a dwarfed form from the Adirondaeks said to reach less than 130 mm. in length.

I have found a very wide range in the maturity of this species, in New Jersey and Pennsylvania. Examples when but 75 mm. long were found with perfectly developed roe and milt, similar to examples 600 mm. The fully adorned male shows the pearl organs on the upper part of the body till level with the axils of the paired fins, and the entire upper surface of the head minutely tuberculated. The dorsal rays, at least anteriorly and basally, lower caudal lobe with its rays, anal rays and inner or upper surfaces of pectoral and ventral all with series of tubercles. On pectoral and ventral tubercles usually a little weaker than elsewhere. The tuberculated males most always have the lower surface of the caudal peduncle rough. I have examined males only 100 mm. with tuberculate anals, also lower caudal lobe and under surface of caudal peduncle rough. Other males 500 mm. were less ornate. Some males show the head more or less tuberculate over parts of its surface.

*Esca lucius* Linné. Two heads sent September 29, the larger from a seven pound fish 792 mm. long. The smaller was nearly two pounds and is of interest in showing a pair of bony spines, splint-like, covered with epidermis and projecting from the top of the head. According to Mr. Goudý during several months of the year, or in the summer, one seldom finds any remains of food in the stomach, except green slime.

*Pomotis gibbosus* (Linné). Small and dark.

*Perca flavescens* (Mitchil). Several.

#### NEW JERSEY.

Collections were made in Bear Brook, a tributary of the Millstone River east of Princeton Junction, on May 28 and June 10; in the Shabboconk Creek, near Bella Vista, June 21, and in September, with Mr. Edwin Fowler. Mr. Wharton Huber made a collection of marine fishes at Corson's Inlet, September 15 to 25.

*Carcharias taurus* Rafinesque. Mr. H. Walker Hand reports eight at Cape May April 21. They were 1220 to 2440 mm. long, and were sold as "gray-fish" at New York for five cents a pound.

*Alopias vulpinus* (Bonnaterre). Mr. Henry S. Drinker reports one taken late in 1920, about 2745 mm. long, at Beach Haven.

*Cetorhinus maximus* (Gunner). Mr. Drinker reports one 4575 mm. long at Beach Haven, May 26, caught in the nets of the St. Albans fish company. Fishermen at Sea Side Park also told us of one brought in there, about 5185 mm., early in August 1920. They also gave the following interesting items for the same season:

*Eulamia milberti* (Le Sueur). Several adults 2440 to 3050 mm.

*Sphyrna zygaena* (Linné). Very abundant though all small, largest 1525 mm. Many taken at different lifts of the pound during the entire season.

*Squatina dumeril* Le Sueur. A few in the pounds, though no actual dates given.

*Torpedo nobiliana* Bonaparte. An example 610 mm. long taken during the summer.

*Mustelus canis* (Mitchill). Prof. Charles LaWall reported one in July 1921, at Longport. During the summer he also found: *Raja eglanteria* Lacépède, several; *Cynoscion regalis* (Schneider), large ones in Great Egg Harbor Bay; *Menticirrhus saxatilis* (Schneider); *Tautoga onitis* (Linné); *Paralichthys dentatus* (Linné).

Mr. Huber found *M. canis* common at Corsons Inlet, with about a dozen examples of *Sphyrna zygaena*.

At Beach Arlington in late August, Mr. G. MacReynolds found it frequent; also: *Raja eglanteria*, *Anguilla rostrata*, *Scomber scombrus*, *Pomatomus saltatrix*, *Centropristis striatus*, *Stenotomus chrysops*, *Cynoscion regalis*, *Micropogon undulatus* and *Paralichthys dentatus*.

*Squatina dumeril* Le Sueur. Mr. Drinker reports one August 13, 1920, about 1195 mm. long. The same season he also found a young example of *Squalus acanthias* Linné early in June, and an adult *Megalops atlanticus* Valenciennes, 915 mm. long, late in June.

*Notropis bifrenatus* (Cope). Bella Vista.

*Notropis chalybaeus* (Cope). Bear Brook and Millstone River.

*Catostomus commersonnii* (Lacépède). Bella Vista.

*Erimyzon sucetta oblongus* (Mitchill). Bear Brook. Mr. L. M. Dorsey reports it from Hammonton, in Atlantic County, July 22. He also found *Rhinichthys atronasus* abundant in small brooks at Blackwood, August 10.

*Esox americanus* (Gmelin). Bear Brook. Mr. W. T. Innes reports it from May's Landing, May 1, with *Ameiurus natalis*, *Aphredoderus sayanus*, *Mesogonistius chaetodon*, and *Enneacanthus gloriosus*.

*Umbra pygmaea* (DeKay). Bear Brook.

*Fundulus majalis* (Walbaum). Corson's Inlet, in the surf. *Fundulus heteroclitus macrolepidotus* very common and large, on the meadows. Mr. Huber also secured a few *Anchovia mitchilli* in the surf, and *Anguilla rostrata* noted large and very abundant.

*Fundulus diaphanus* (Le Sueur). Bella Vista.

*Cyprinodon variegatus* Lacépède. One from the gullet of a Hooded Merganser killed at Barnegat November 26, 1921. I also examined a mossbunker (*Brevoortia tyrannus*) taken from a Red-throated Loon, shot at Salem, November 24? The loon was said to have had two mossbunkers inside, the one I examined measuring 90 mm.

*Syngnathus fuscus* Storer. Common in the surf at Corson's Inlet.

*Menidia menidia notata* (Mitchill). Corson's Inlet, common in the surf with the next.

*Mugil curema* Valenciennes.

*Thunnus thynnus* (Linné). Mr. Drinker reports it common 25 miles off Barnegat, during the summer, examples of 12 to 50 pounds, and large ones occasional. Other notes he sends from Beach Haven are as follows:

*Sphyrna zygaena* (Linné). Two small ones.

*Megalops atlanticus* Valenciennes. Two in the pounds.

*Euthynnus alleteratus* (Rafinesque). Common off shore, also the next.

*Sarda sarda* (Bloch).

*Pomatomus saltatrix* (Linné). Common and runs to 13 pounds off shore.

*Coryphaena hippurus* Linné. Small one August 25.

*Cynoscion regalis* (Schneider). Common in Barnegat Bay with the next two.

*Pogonias cromis* (Linné).

*Paralichthys dentatus* (Linné).

*Trachinotus carolinus* (Linné). Common in the surf at Corson's Inlet. An example of *Strongylura marina* about a foot long also reported from this locality, besides several of *Seriola zonata*.

*Pomatomus saltatrix* (Linné). Two young in the surf at Corson's Inlet. Frequent about the mouth of the Inlet, and large ones at sea.

*Mesogonistius chaetodon* (Baird). Bear Brook.

*Lepomis auritus* (Linné). Bear Brook.

*Pomotis gibbosus* (Linné). Millstone River and Bella Vista.

*Bairdiella chrysura* (Lacépède). Young in the surf at Corson's

Inlet. Mr. Huber also reported a few *Roccus lineatus*, frequent and fairly large *Centropristis striatus*, few *Stenotomus chrysops*, large *Cynoscion regalis* common, and four *Cynoscion nebulosus* on September 23. In July Mr. J. A. G. Rehn reported *Centropristis striatus*, *Cynoscion regalis*, *Paralichthys dentatus* and *Opsanus tau* in Barneget Bay at Beach Haven. During late September Mr. D. McCadden found *Centropristis striatus*, *Orthopristis chrysopterus*, *Cynoscion regalis*, *Leiostomus xanthurus*, *Pogonias cromis* and *Paralichthys dentatus* at Ocean City.

*Menticirrhus saxatilis* (Schneider). Young common in the surf at Corson's Inlet. Mr. Huber reports at this place an example of *Sciaenops ocellatus* of 36 pounds and another of 52 pounds; a few *Leiostomus xanthurus*, *Micropogon undulatus* common and large, also *Tautoga onitis*, an example of *Chilomycterus schoepfi* about 253 mm. long and many large *Paralichthys dentatus*.

*Diodon hystrix* (Linné). August 24, 1921, Mr. R. P. Schriver Jr., reported an example captured at this place which he skinned out and sent later. The skin now measures 320 mm. Color when fresh blackish-slate passing through slate color to gray on upper parts of side. Back with numerous close-set dark or blackish spots. Fins all more or less dusky terminally, with obscure blackish spots, most distinct on caudal and only few about pectoral axil. Bases of pectoral and ventral pale. Lower surface of head and trunk white, though narrow slate-gray band crosses throat. Sides of head slate-gray. But a single small example ever obtained previously, and that at Atlantic City many years ago.

*Mola mola* (Linné). An example, said to have weighed 380 pounds and measured 1423 mm. was captured off McCray's Shoal, about four miles off Cape May, August 12.

*Phycis regius* (Walbaum). Mr. W. T. Innes secured two young at Corson's Inlet, with a young example of *Pomolobus pseudoharengus*.

Dr. R. O. Van Deusen has kindly sent more or less complete notes on the fishes observed by him at Atlantic City during the season of 1921, of which the following resumé appears noteworthy: *Carcharias taurus*, 8 to 10 during June and July and about 20 during the season; *Mustelus canis*, common all summer; *Eulamia milberti*, two young in August; *Sphyrna zygaena*, 5 or 6 small ones in one haul in October; *Squalus acanthias*, common in October and Nov-

ember; *Squatina dumeril*, one 915 mm. long June 30, and adult in late October; *Raja eglanteria*, common; *Dasyatis say*, few at intervals during August, some young; *Rhinoptera bonasus*, adult in late September; *Acipenser sturio*, 25 in early May; *Pomolobus aestivalis*, small numbers in early summer; *Alosa sapidissima*, 11 during October 28 and 29; *Opisthonema oglinum*, 2 in late August; *Brevoortia tyrannus*, common; *Anchovia mitchilli*, 2 in July; *Anguilla rostrata*, few in spring and common in fall; *Conger conger*, 8 in November; *Syngnathus fuscus*, 15 or 20 off the wreck in late August; *Hippocampus hudsonius*, 8 from July to middle of October; *Strongylura marina*, 300 or more in September around the nets; *Mugil curema*, 15 in mid October; *Trichiurus lepturus*, 1 in the spring; *Seriola zonata*, 8 in October; *Caranx crysos*, 10 from August to October; *Vomer seta pinnis*, young very abundant about 35 mm. long in September, and adults irregular through summer; *Trachinotus carolinus*, 400 young in September and October; *Pomatomus saltatrix*, September and October, several full-grown; *Poronotus triacanthus*, common; *Palimurichthys perciformis*, seven during September and October; *Roccus lineatus*, 4 or 5 large ones in spring and a few in the fall; *Morone americana*, common in fall; *Centropristis striatus*, 7 taken irregularly and common at the wreck; *Lobotes surinamensis*, adult June 8 of about 6 pounds weight; *Orthopristis chrysopterus*, 6 at intervals during summer; *Stenotomus chrysops*, abundant at the wreck; *Lagodon rhomboides*, common in September and October but rather small; *Cynoscion regalis*, common, *C. nebulosus*, 5 in October; *Bairdiella chrysura*, frequently irregular in summer; *Sciaenops ocellatus*, few large ones and 6 young; *Leiostomus xanthurus*, common; *Micropogon undulatus* common in spring and fall; *Menticirrhus saxatilis*, common; *Pogonias cromis*, common and all adults; *Tautogolabrus adspersus*, few; *Tautoga onitis*, common, especially in fall; *Chaetodipterus faber*, 2 adults in September; *Chaetodon ocellatus*, one about 75 mm. long October 18; *Pomacanthus arcuatus*, young example October 18; *Balistes carolinensis*, adult on October 1; *Stephanolepis hispidus*; 2 in early September; *Alutera schoepfii*, small example in August; *Spheroides maculatus*, common; *Chilomycterus schoepfii*, common; *Prionotus carolinus*, few; *P. evolans strigatus*, few; *Myoxocephalus octodecimpinosus*, common in November; *Cyclopterus lumpus*, one about 75 mm. long in June; *Leptecheneis naucrates*, 6 in September; *Lophopsetta maculata*, common; *Paralichthys dentatus*,

common; *Pseudopleuronectes americanus*, common; *Achirus fasciatus*, few irregularly; *Astroscopus guttatus*, one in September; *Opsanus tau* frequent in fall; *Pollachius virens*, 1 on October 10; *Microgadus tomcod*, common in late October and during November; *Gadus callarias*, one July 4 and frequent in November; *Phycis regius*, 4 in October; *P. chuss*, common in fall; *Merluccius bilinearis*, spring and late fall; *Lophius piscatorius*, common.

#### DELAWARE.

Mr. W. J. Fox reported a few species from Bowers Beach, July 30 and 31. Dr. Thomas Barbour gave me a list of eight species he met with off Ship John Light, August 19. With Messrs. Innes and Dorsey I visited Wyoming Pond on August 20. This is formed simply as a wide pond about a mile long, by the dam on the tributary of Jones Creek called Wyoming Creek. The water is still and very hard, the banks mostly of sand, shallow and sloping. Along each bank we found wide growths of aquatic vegetation, often as great mats of *Ceratophyllum*. In the more sheltered small coves the water was often covered with a mantle of green algae, duckweed, etc. Mr. G. MacReynolds sent some notes on food fishes he captured at Delaware City and St. Georges in 1905, interesting in comparison with present conditions.

*Carcharias taurus* Rafinesque. About a dozen at Bowers Beach.

*Eulamia milberti* (Müller and Henle). Small example at Ship John.

*Sphyrna zygaena* (Linné). Small one at Bowers Beach.

*Raja erinacea* Mitchill. One at Bowers Beach.

*Dasyatis say* (Le Sueur). One at Ship John.

*Ameiurus catus* (Linné). Common at Delaware City and St. Georges, reaching about 300 mm. At Wyoming Pond *Ameiurus nebulosus*, *Anguilla rostrata* and *Perca flavescens* were reported abundant. *Morone americana* was said to have been introduced during the past few years, prior to which none were seen for twenty years.

*Abramis crysoleucas* (Mitchill). Abundant, all small, in Wyoming Pond.

*Erimyzon sucetta oblongus* (Mitchill). Young very common in Wyoming Pond.

*Esox americanus* (Gmelin). One in Wyoming Pond.

*Esox tridecemlineatus* Mitchill. Abundant in Wyoming Pond,

Delaware City and St. Georges. Mr. MacReynolds found the largest about 660 mm.

*Fundulus heteroclitus macrolepidotus* (Walbaum). Common at Delaware City and St. Georges.

*Enneacanthus gloriosus* (Holbrook). Very abundant, the young everywhere in vegetation at Wyoming Pond.

*Lepomis auritus* (Linné). Several adults at Wyoming Pond.

*Pomotis gibbosus* (Linné). Abundant, many adults about usual color. Wyoming Pond. St. Georges and Delaware City.

*Micropterus salmoides* (Lacépède). Common in Wyoming Pond, none over a foot in length. St. Georges.

*Perca flavescens* (Mitchill). Very abundant at St. Georges and Delaware City, some two pounds in weight.

*Centropristis striatus* (Linné). One at Ship John.

*Cynoscion regalis* (Schneider). Bowers Beach and Ship John.

*Bairdiella chrysura* (Lacépède). Ship John.

*Leiostomus xanthurus* Lacépède. Ship John.

*Micropogon undulatus* (Linné). Bowers Beach and Ship John.

*Menticirrhus americanus* (Linné). The same date last year Dr. Barbour says all the species secured this year were also found, but with the addition of the present one.

*Opsanus tau* (Linné). Adult at Bowers Beach and few at Ship John.

#### MARYLAND.

During mid September Mr. H. L. Mather found a few fishes in the Little Bohemia Creek, in Cecil County.

*Ameiurus nebulosus* (Le Sueur).

*Abramis crysoleucas* (Mitchill).

*Notropis hudsonius amarus* (Girard).

*Anguilla rostrata* (Le Sueur).

*Pomotis gibbosus* (Linné).

*Perca flavescens* (Mitchill).

*Morone americana* (Gmelin).

*Leiostomus xanthurus* Lacépède. Small example.

*Gobiosoma bosc* (Lacépède). November 26, Mr. R. M. Abbott secured an example of this and the following in the Rhodes River, near Mayo, Anne Arundel County. Both were found in empty oysters shells.

*Gobiosox strumosus* Cope.



## VIRGINIA.

(1) Mr. Dunn's collection from the head of the James River at Midway Mills in Nelson County, made in 1917 is the most important.

*Ictalurus punctatus* (Rafinesque). One 275 mm.

*Campostoma anomalum* (Rafinesque). Small one.

*Chrosomus oreas* Cope. Abundant.

*Hybognathus nuchalis* Agassiz. Eight, largest 88 mm.

*Semotilus bullaris* (Rafinesque). Common. Largest 168 mm.

*Semotilus atromaculatus* (Mitchill). Two young.

*Leuciscus vandoisulus* Valenciennes. Thirty-three, adult with red sides. Whole upper surface of head with fine though sharp and rather sparse tubercles, each supraoccipital row distinct, though no tubercles on side of head below eyes.

*Abramis crysoleucas* (Mitchill). Three of medium size.

*Notropis hudsonius* (Clinton). Nineteen, largest 58 mm.

*Notropis cerasinus* (Cope). Very common, largest 115 mm.

*Notropis photogenis amoenus* (Abbott). Five, largest 47 mm.

*Rhinichthys atronasmus* (Mitchill). Seventeen.

*Hybopsis kentuckiensis* (Rafinesque). Common, largest 132 mm.

*Catostomus commersonnii* (Lacépède). Six small ones.

*Catostomus nigricans* Le Sueur. Four; of two larger ones one 216 mm.

*Catostomus rhothoecus* (Thoburn) Jordan and Evermann. Bull. U. S. Nat. Mus., No. 47, vol. 1, 1896. p. 181. "Some point in eastern Tennessee or southwestern Virginia, thought to be from French Broad River at Wolf Creek, Tennessee."

Head  $4\frac{1}{5}$  to  $4\frac{2}{3}$ ; depth  $4\frac{2}{5}$  to  $4\frac{3}{4}$ ; D. III, 9, I; A, III, 6, I; scales 43 or 44 in lateral line to caudal base and 3 more on latter; 7 scales above l. l., 6 below; predorsal scales 17 or 18; snout 2 to  $2\frac{3}{4}$  in head; eye  $3\frac{1}{8}$  to  $4\frac{3}{4}$ ; interorbital  $2\frac{1}{4}$  to  $2\frac{3}{4}$ , moderately convex. Snout protruding beyond mouth. Width of mouth nearly  $\frac{1}{3}$  of head. Lips with moderate plicae, lower with well marked median division. Dorsal inserted much nearer snout tip than caudal base. Anal depressed, reaches little beyond caudal base, little shorter in young. Caudal forked. Pectoral much longer than head, nearly reaches opposite dorsal origin. Ventral little shorter than head.

Color in alcohol dusky-olive generally on back. Narrow blackish lateral band from snout below eye to caudal base, its upper boundary obscured by dark color of back and lower contrasted with bright white of entire lower surface. Within lateral band six

slightly deeper lateral blotches on trunk. In young these blotches obsolete. Caudal base brown. Iris brassy. Lips whitish, like under surface of head. Fins pale, dorsal and caudal slightly darker than others. Here described from 46 specimens, 48 to 120 mm. long.

This species is only known from six examples previously, with unknown locality. The reference to its original description in the Proceedings of the U. S. National Museum for 1894 is erroneous, as I find no mention of it either in the volume for that year or those previously. The rediscovery of the species is therefore of some interest. Its appearance somewhat suggests *Catostomus nigricans*, though its greatly darker coloration above and greatly contrasted white lower regions, very large lower fins, flat or slightly convex interorbital, etc., will serve at once to distinguish it.

*Anguilla rostrata* (Le Sueur). One adult.

*Lepomis auritus* (Linné). One.

*Micropterus dolomieu* (Lacépède). Two young.

*Hadropterus peltatus* (Cope). One example. Compared with Pennsylvania examples it shows a more pointed snout.

*Boleosoma nigrum effulgens* (Girard). In searching for some clue for the distinction of *Etheostoma olmstedi* Storer from *Etheostoma nigrum* Rafinesque I examined the scales of both to test how far the contentions of Prof. Cockerell<sup>1</sup> would hold. Evidently his materials were limited or the conclusions very hurriedly set forth. As a fact I have found specimens, usually young or half grown, which in every way agree with his figure 16 of *Boleosoma nigrum*, but which are really *Boleosoma olmstedi*. The apical teeth of the scale, when free from the marginal membrane, is not always indicated in scales from *Boleosoma nigrum*. Such is frequently the case in *Boleosoma olmstedi* at all ages. The arrangement of the subapical elements below the apical denticles is also very variable and whether transversely elongated or subtriangular apparently largely a matter of age, certainly a condition of great variation.

*Etheostoma longimanus* Jordan, and *Etheostoma podostemone* Jordan and Jenkies, are both to be distinguished from *Boleosoma nigrum* Rafinesque, according to Jordan, and Evermann, by their much longer pectorals. Now the series of 46 examples before me from Midway Mills shows the pectoral in half the series variably longer than the head and in the other half equally shorter. I have

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<sup>1</sup>Bull. Bur. Fisher., 32, 1912 (1913). p. 157.

found in New Jersey and Pennsylvania examples of *Boleosoma olmstedii* with pectorals equally as long as the Virginian, and the variation present both in young and adult. I have seen breeding males of *Boleosoma nigrum* inky or entirely black. Of the numerous males of *Boleosoma olmstedii* the body or trunk never becomes black, usually with some brown or olive, or at least noticeably pale in contrast. Moreover I have never seen a breeding male of *Boleosoma nigrum* much over 63 mm., while the male of *Boleosoma olmstedii* frequently reaches 25 mm. more.

My Virginia specimens all agree at least with *Arlina effulgens* Girard, which appears to be the southern representative. It approaches *Boleosoma nigrum* perhaps more closely than *Boleosoma olmstedii*, at least in its smaller size.

*Poecilichthys flabellaris* (Rafinesque). Two.

(2) My first collecting in Virginia was in a tributary of the Dan River west of Danville, Roanoke basin in Pittsylvania County, October 21, 1921. This stream is very clear flowing over a sandy and gravelly bottom, and an excellent place to use a minnow seine. In most places it was bare of obstructions and snags, and had many pools of moderate depth. The fish were abundant mostly about the little eddies and backwater pools, especially along the bends of the stream. One deep stagnant pool, with simply a gravel bottom, yielded a great lot of fish, as here they had evidently been entrapped during high water.

*Chrosomus oreas* Cope. Frequent.

*Notropis procne* (Cope). Five.

*Notropis whiplii analostanus* (Girard). Series of 135, many pale and none with the blue lateral band of *Notropis niveus*. One example distorted with sigmoid pattern to the haemal region of vertebral column vertically.

*Notropis cerasinus* (Cope). Very abundant.

*Notropis photogenis amoenus* (Abbott). Very common and variable.

*Hybopsis kentuckiensis* (Rafinesque). Abundant and all very young.

*Catostomus nigricans* Le Sueur. Young.

*Ameiurus nebulosus* (Le Sueur). One young.

*Lepomis auritus* (Linné). Young.

*Boleosoma nigrum* (Rafinesque). One.

*Poeciliichthys flabellaris* (Rafinesque). Two small examples. Both have seven dark saddles down middle of back.

(3) The same day we visited Falls Creek, also a tributary of the Dan River just east of Danville. It is very similar to the above. Fish life was also very abundant, and many large schools were found in the deeper pools. I am indebted to Mr. W. C. Hilderman, of Danville, for much assistance while collecting in Virginia.

*Chrosomus oreas* Cope. Common.

*Notropis procne* (Cope). Few.

*Notropis whippitii analostanus* (Girard). Very common, variable. One adult with some white pigment in its fins.

*Notropis cerasinus* (Cope). Head  $3\frac{1}{2}$  to  $3\frac{7}{8}$  depth 4 to  $4\frac{1}{5}$ ; D. III, 7, 1; A. III, 8, 1; scales 38 in lateral line to caudal base and 2 more on latter; 6 or 7 scales above l. l., 4 or 5 below; 18 to 20 predorsal scales; snout 3 to 4 in head; eye  $2\frac{1}{2}$  to  $3\frac{2}{5}$ ; maxillary 3; interorbital 3 to  $3\frac{1}{5}$ . Body deep, well compressed. Head compressed. Muzzle conic, length  $\frac{3}{5}$  to  $\frac{2}{3}$  its width. Eye moderate, less than snout. Mouth inclined, moderate, lower jaw included. Maxillary to hind nostril. Interorbital convex. Teeth 2, 4—4, 2, hooked, with strong grinding surfaces. Scales very narrowly imbricated along sides, especially in costal region, small, crowded and well exposed on predorsal, breast and belly. Scales with 12 to 17 apical radiating prominent striae, circuli coarse. Upper surface and side of head above with fine sharp and rather scattered tubercles, row of larger close set ones around upper jaw edge, none on mandible, though others extended up on predorsal medianly.

Color in alcohol with black or dusky markings on side very variable, usually as two or three rather large clusters. All fins with more or less orange-red medianly, especially brilliant on anal and paired fins. Sides flushed with crimson.

Very abundant, in large schools in the deeper places. Though a common species it is little known. The fully ornate males at this late season are very interesting. Readily distinguished from *Notropis cornutus* by the dark lateral blotches and nearly entirely red fins.

*Notropis coccogenis* (Cope). Seven, largest 78 mm. Sometimes mandible not protruding beyond upper jaw.

*Notropis ariommus* (Cope). Head  $3\frac{3}{5}$ ; depth 5; D. III, 7; A. III, 8; scales 39 in lateral line and to caudal base, 2 more on latter; 32 tubular scales in l. l.; 6 scales above l. l., 5 below; predorsal scales 18; snout  $3\frac{2}{3}$  in head; eye  $2\frac{3}{5}$ ; maxillary 3; interorbital  $3\frac{1}{4}$ . Body and head well compressed. Snout much less than eye, length  $\frac{3}{5}$  its width. Eye greatly larger than snout, high. Maxillary extends little beyond eye front. No barbel. Mandible

slightly protrudes. Scales all broadly exposed, crowded along dark median predorsal line. Lateral line incomplete, though reaches caudal peduncle. Dorsal inserted slightly behind ventral origin. Back pale olive, scale edges dusted dusky. Underlaid leaden band from eye to caudal base, more intensified blackish dots along caudal peduncle side and at caudal base, though not forming well-defined black caudal spot. Lower parts and iris silvery-white. Fins pale. Length 45 mm.

No previous notice of the occurrence of this species east of the Alleghenies has been given.

*Notropis photogenis amoenus* (Abbott). Very common. Several males with snout and dorsal fins orange-red.

*Hybopsis kentuckiensis* (Rafinesque). Common, though all small.

#### NORTH CAROLINA.

The fishes examined from this State were all obtained by Mr. Dunn in 1917, in a small tributary of the French Broad River near Brevard, Transylvania County, with the exception of one species from Linville.

*Camptostoma anomalum* (Rafinesque). Abundant. Largest 128 mm. One abnormal, with hunched back.

*Notropis spectrunculus* (Cope). Eleven examples 50 to 70 mm. The black spot at the caudal base is triangular in shape. Dr. H. M. Smith says it is "exceedingly abundant in the upper waters of the Swannanoa, but is scarce in other tributaries of the French Broad." I have compared examples in the Academy from the French Broad in Henderson County.

*Notropis coccogenis* (Cope). Very abundant. Specimens of all ages secured the largest 110 mm. Adult males with front edge of snout, preorbital and mandibular rami covered with small tubercles. Also inner surfaces of pectoral rays with each of larger with row of fine tubercles. In preserved examples the blackish humeral bar, band on upper portion of dorsal and submarginal crescent distinct.

*Notropis brimleyi* B. A. Bean.

Head  $3\frac{2}{3}$  to  $3\frac{4}{5}$ ; depth  $4\frac{1}{4}$  to  $4\frac{4}{5}$ ; D. III, 7, I; A. III, 7, I; scales 35 to 38 in lateral line to caudal base and 2 more on latter; 6 or 7 scales above l. l., 4 or 5 below; predorsal scales 15 to 21; snout  $3\frac{1}{6}$  to  $3\frac{2}{5}$  in head; eye  $3\frac{1}{4}$  to  $3\frac{2}{3}$ ; maxillary  $2\frac{2}{5}$  to  $2\frac{3}{5}$ ; interorbital 3 to  $3\frac{2}{5}$ . Body elongately fusiform, moderately compressed. Muzzle pointed slightly longer than eye in adult, its length about  $\frac{7}{8}$  its width. Mouth oblique, lower jaw slightly included. Maxillary reaches opposite front pupil edge. Interorbital little wider

than eye. Teeth 2, 5—5, 2, with moderate grinding surfaces. Scales largest and slightly imbricated along middle of sides. Apical marginal striae 10 to 18. Dorsal inserted slightly nearer caudal base than snout tip, nearly midway in young, slightly behind ventral origin. Color in alcohol, back brown with scales distinctly dark edged, in some examples sharply so and approaching dusky or black. Leaden lateral band from shoulder to caudal base medianly, becoming blackish on latter and side of caudal peduncle, so that distinct black spot at caudal base, more or less reflected out in median caudal rays basally. Dark median line down back. Fins all pale. Iris, sides of head and lower surface of body largely whitish with silvery reflections. Many examples show edges of costal scales sharply dusky and dark oblique line from shoulder to pectoral axil. An adult male shows end and edge of snout, also sides of mandible, finely tuberculate. Thirty-three examples, 25 to 75 mm.

Quite variable when preserved, especially color and size of eye. This species does not seem to have been found since described.

*Rhinichthys atronasmus* (Mitchill). Twenty-four examples, largest 69 mm.

*Fundulus catenatus* (Storer). Nine young from Linville, the only species from this locality.

*Poeciliichthys flabellaris* (Rafinesque). Six.

*Cottus bairdii* Girard. Five, largest 60 mm.

#### SOUTH CAROLINA.

(1). On October 19, 1921, we visited the Pacolet River above Spartanburg, in the basin of the Broad River, Spartanburg County. At the dam, just east of the town, this is a broad muddy stream, with many soft banks in the back-water. Below the dam we found a mass of shallow pools, with debris, snags, many large rocks, etc. Few fish were found except in the deep holes, and these all of small size.

*Ameiurus catus* (Linné). Young examples.

*Abramis crysoleucas* (Mitchill). Four, mostly silvery, though otherwise very pale.

*Notropis hudsonius saludanus* (Jordan and Brayton). One example 67 mm. Caudal with very pale spot.

*Notropis nircus* (Cope). Four small ones.

*Notropis scepticus* (Jordan and Gilbert).

Head  $3\frac{3}{5}$  to 4; depth 4 to  $4\frac{1}{2}$ ; D. III, 7, 1, forward rudimentary rays abnormally 1; A. III, 10, 1, abnormally II, 7, and III, 2; scales

22 to 35 in lateral line to caudal base and 2 more on latter; 6 scales above l. l., 4 below, predorsal scales 15 to 18, snout  $3\frac{1}{5}$  to  $3\frac{2}{5}$  in head; eye 3 to  $3\frac{1}{3}$ ; maxillary  $2\frac{3}{4}$  to  $3\frac{1}{3}$ ; interorbital  $3\frac{1}{4}$  to  $3\frac{2}{3}$ . Body well compressed, rather deep, also head. Muzzle conic, length  $\frac{3}{4}$  its width. Eye large, slightly larger than snout, less than interorbital. Maxillary reaches eye. Upper lip opposite eye center, jaws equal. Interorbital convex. Teeth 1, 4—4, 1, hooked, with grinding surfaces. Lateral scales rather narrowly imbricated, predorsal smaller, though without crowded appearance. Scales with 6 to 18 apical marginal striae, circuli coarse. Dorsal origin well behind ventral origin or slightly nearer caudal base than snout tip. Color in alcohol pale grayish, sides of head and lower surface with bright silvery-white tints. Median lateral plumbeous streaks along side of caudal peduncle. Edges of scales on back slightly dusky. Four examples, 55 to 65 mm. long.

This is the southern deeply-bodied ally of *Notropis photogenis* and occurs chiefly in the Santee Basin. Though said to be abundant locally we secured only the few examples described above, all with abnormal fins and one with an abortive snout, snub-nosed.

*Hybopsis kentuckiensis* (Rafinesque). Young one.

*Gambusia affinis* (Baird and Girard). Very common.

(2). Later in the day we visited Fair Forest Creek, also basin of the Broad River, near Arkwright, Spartanburg County. This is a clear brook where we explored, flowing over a rocky and gravelly bottom. All the rocks were of moderate size. The stream was without any submerged aquatic vegetation, except a little celgrass in its lower reaches which contained many cray-fishes (*Cambarus*).

*Notropis lutipinnis* (Jordan and Brayton).

Head 4; depth  $3\frac{1}{2}$  to 4; D. III, 7, 1; A. III, 6 or 7, 1; scales 37 in lateral line to caudal base and 2 more on latter; 7 scales above l. l., 4 or 5 below; predorsal scales usually 17; snout  $3\frac{1}{5}$  to  $3\frac{1}{2}$  in head; eye  $3\frac{1}{4}$  to  $3\frac{1}{3}$ ; maxillary  $2\frac{7}{8}$  to  $3\frac{1}{8}$ ; interorbital  $2\frac{3}{4}$  to  $2\frac{7}{8}$ . Body well compressed deep. Head compressed, short. Muzzle conic, length about  $\frac{3}{4}$  its width. Eye rather large. Mouth moderate, lower jaw slightly included. Maxillary reaches eye. Interorbital convex. Teeth 2, 4—4, 2, hooked, with grinding surfaces. Upper surface and sides of head finely tuberculate. Scales all well exposed, slightly crowded before dorsal. Scales with radiating apical striae conspicuous, 11 to 15, circuli coarse. Dorsal origin behind ventral origin, about midway between snout tip and caudal base. Color in alcohol with all fins, at least basally, bright yellow. Males largely with body flushed with pink to reddish. Broad black lateral band very conspicuous, though best defined along caudal peduncle side, bordering above a gamboge-olive streak. Twenty examples, 47 to 53 mm.

This species is greatly suggestive of *Notropis chalybaeus*, but differs in coloration, especially its characteristic yellowish fins and broader black lateral band. We found it only in the deeper pools.

*Hybopsis kentuckiensis* (Rafinesque). Very abundant. All taken are young.

*Lepomis auritus* (Linné). Six examples, largest 85 mm.

(3). October 18 we visited the Saluda River at Piedmont, in Greenville County. This muddy river for about three miles did not afford a single suitable place to operate our small seine. The banks were steep and mostly all overgrown, and very few places even accessible from them. About a mile below Piedmont we found a small estuary, known as "Depot Branch," the only place we could examine satisfactorily. Above, Depot Branch was found to be but a small brook, partly polluted from near-by dwellings, though it contained a number of fishes. It flows chiefly through a sandy valley of cotton and corn fields. Though we did not meet with any, eels were said to ascend its reaches. The river fishermen reported various suckers, "carps", "white-carps", chubs, cats, yellow-cats, channel-cats, crappies, sunfish, fliers, spotted-sunfish, and yellow-perch in the river. The following fishes were all obtained in Depot Branch:

*Schilbeodes insignis* (Richardson). One 110 mm. It agrees in every way with Pennsylvania specimens.

*Hybognathus nuchalis* Agassiz. Eight, largest 70 mm. Coloration very pale. Back pale olivaceous, sides and below silvery-white.

*Semotilus atromaculatus* (Mitchill). Abundant, all small.

*Notropis niveus* (Cope). Series of 270 examples, largest 57 mm. In alcohol the dark lateral streaks only distinct along side of caudal peduncle, ending in the rather faint dusky basal caudal spot. Along side medianly this streak dull blue, in life. My specimens evidently represent the *Codoma chloristia* Jordan and Brayton, a synonym of the present species.

Very abundant in large schools in the deeper pools about the more quiet places. A handsome little fish, similar, or greatly like *Notropis whipplei*. No example in nuptial coloration met with.

*Notropis lutipinnis* (Jordan and Brayton). Thirteen examples, largest about 40 mm.



*Hybopsis rubrifrons* (Jordan). Five small examples, which agree with those from Toccoa Creek.

*Minytrema melanops* (Rafinesque). Young example.

*Lepomis auritus* (Linné). Two young.

#### GEORGIA.

(1). Toccoa Creek, tributary of the Chatooga River in the Tungalow River Basin, near Toccoa, Stephen County, was visited October 17. This is a stream of moderate size, with sandy and gravelly bottom. It is polluted with three local sewers, though apparently not greatly detrimental to fish-life, which was very abundant in the pools. Large suckers, cats, sunfish and perch were reported abundant.

*Notropis rubricroceus* (Cope). Very abundant and found in schools of varying size, of from a few individuals to several hundred. We secured over three hundred specimens. In the adults snout brilliant orange. Often small examples show an orange tip to the snout, without the brilliant orange-red color of the body in general. In the young often also dorsal base, caudal and other fins all more or less tinted with pale orange.

*Hybopsis rubrifrons* (Jordan).

Head  $3\frac{1}{2}$  to  $3\frac{4}{5}$ ; depth  $4\frac{1}{4}$  to 5; D. II, 7; A. II, 7, scales 35 in lateral line to caudal base and 2 more on latter, 6 scales above l. l., 5 below; 14 predorsal scales; snout 3 to  $3\frac{3}{4}$  in head; eye  $3\frac{1}{5}$  to  $3\frac{3}{4}$ ; maxillary 3 to  $3\frac{2}{5}$ ; interorbital 3 to  $3\frac{1}{4}$ . Body fusiform, moderately compressed. Head conic, scarcely compressed. Snout conic, somewhat depressed, length about  $\frac{2}{3}$  its width. Eye high, less than snout, little advanced, equals interorbital, greater than snout and interorbital in young. Mouth small, snout greatly protruding. Maxillary reaches eye, terminal barbel always conspicuous. Interorbital broadly convex. Teeth 1, 4 — 4, 1, hooked, with grinding surfaces. Scales more or less uniform, absent from breast, with 10 to 13 radiating striae, and circuli moderate. Color in alcohol with back pale olivaceous, each scale on back bordered broadly with dull dusky dots. Dusky leaden band from front of preorbital to base of caudal, where it ends in a small dusky spot. Under surface of head and trunk, below lateral band, bright silvery white. Fifty specimens, 40 to 84 mm.

Abundant in the channels, associated with the other species. Compared with *Hybopsis amblops*, from Paint Rock, Alabama, the eye of the latter is larger, greater than either the snout or interorbital space. In *Hybopsis rubrifrons* the eye is distinctly smaller than the snout and though it often equals the interorbital is

usually less. Its head is also shorter and broader though Jordan and Evermann say "head long, narrower than in *H. amblops*."<sup>2</sup>

The plumbeous median lateral band of *Hybopsis rubrifrons* extends indistinctly around the snout and is usually within the compass of the lateral line, ending in a dark caudal spot not especially pronounced. Each scale of lateral line with a cluster of black dots, one above and the other below each tube. At this season our specimens are with pale olivaceous backs, scales dark edged and sides below bright silvery white. Fins also pale. No red. *Hybopsis rubrifrons* was originally described from the South Fork of the Ocmulgee River at Flat Rock in De Kalb County, based on six specimens. Its occurrence and abundance in the Savanna Basin is therefore of interest.

*Hybopsis kentuckiensis* (Rafinesque). Very abundant. Though without ornamentation at this season all the specimens show the dorsal and anal nearly bittersweet-orange in tint, varying to more deeply in some individuals. The dark median lateral band distinct, though not conspicuous, only faintly present in the adults, the largest 116 mm. Ninety specimens.

*Catostomus nigricans* (Le Sueur). Six largest 93 mm.

*Mimytrema melanops* (Rafinesque). Six small examples.

(2). In a small tributary brook of Toccoa Creek, near Toccoa, we found many fine minnows. This stream is of rapid cold water, flowing over rocks with many cascades, riffs, and a few water-falls.

*Semotilus atromaculatus* (Mitchill). One young example.

*Notropis rubricroceus* (Cope). The most abundant species in all the rock-pools, and deeper places in the brooks. The adults, largely silvery at this time, have much the appearance of *Leuciscus vandoisulus*.

*Hybopsis kentuckiensis* (Rafinesque). Seven young.

*Catostomus nigricans* (Le Sueur). Three young.

*Mimytrema melanops* (Rafinesque). One young.

(3). On October 16, the headwaters of the Oconee River, near Lula, Hall County, were visited. The stream we visited was a small clear cold spring-fed brook. It flows through bottom-lands with little incline, over gravel and red clay. In most places it is difficult to approach, on account of thickets and shrubs.

<sup>2</sup> Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 320.

*Semotilus atromaculatus* (Mitchill). Three examples, largest 90 mm.

*Notropis rubricroceus* (Cope). Twenty-six, largest 70 mm. The young of this species differ from those of *Notropis coccogenis* in the dark lateral band distinct on the head and front part of the body, also continuous around snout. Also its dorsal is flushed with orange. Our largest example in alcohol shows the back and sides forward nearly grenadine-red and rest of body more or less flushed orange. Iris tinged with orange. In life these colors were variably conspicuous, appearing only as a slight rosy flush, the general appearance of the fish bright silvery white. The dark line down the back medianly very distinct, especially on predorsal region.

*Hypopsis kentuckiensis* (Rafinesque). Twelve examples, largest 42 mm. Compared with Susquehanna River examples in the Academy, from Pennsylvania, they agree in every way. The small blackish spot at the caudal base is present in all.

*Poecilichthys inscriptus* (Jordan and Brayton).

Head  $3\frac{2}{3}$  to  $3\frac{3}{4}$ ; depth 5 to  $5\frac{1}{4}$ ; D. X, I, 9 or 10; A. II, II, 5, or 7, or I, 7; scales 44 or 45 in lateral line to caudal base and 2 more on latter, though only one of last tubular; 5 scales above l. l. to spinous dorsal origin, 7 below; 12 to 14 predorsal scales; snout  $3\frac{2}{5}$  to  $3\frac{1}{2}$  in head; eye  $3\frac{1}{2}$  to  $4\frac{1}{8}$ ; maxillary  $3\frac{1}{4}$  to  $3\frac{2}{5}$ ; interorbital  $1\frac{1}{4}$  to  $1\frac{1}{2}$  in eye. Body elongated, compressed, caudal peduncle rather deep. Head large, front profile steep. Snout obtuse. length about  $\frac{2}{3}$  its width. Eye high, greater than interorbital. Mouth moderate, little inclined, lower jaw included. Maxillary reaches pupil. Interorbital nearly level. Gill-rakers 2+7, lanceolate. Gill-membrane forms broad free fold across isthmus. Head and breast naked. Scales with 11 to 13 basal striae, apical denticles 30 to 32, their basal elements in about four series, and circuli moderate. Caudal slightly emarginate behind. Color when fresh rich olive brown above, with reddish spot on most scales. Down back six dark saddles, one just before spinous dorsal, second at front dorsal spines, third at junction of dorsals, fourth at front of soft dorsal, fifth close behind soft dorsal and sixth on caudal peduncle near caudal. On sides, mostly below lateral line row of seven dark olive blotches. Dark line from eye to snout tip, slightly on upper lip. Cheeks, opercles and anal brilliant blue green, bar below eye dusky. Fins pale, spinous dorsal with submarginal black band, below and adjoining an orange one, and each membrane dusky basally. Soft dorsal with about three pale dusky longitudinal bands, same on caudal. Pectoral tinted with dull orange basally, and six dusky cross-bars. Ventral whitish. Three examples, 38 to 65 mm.

This handsome little fish was found only in the ripples or little rapids. Previously only known from the type, obtained at Sulphur Springs in Hall County in 1878.

(4). In South Utoy Creek, basin of the Chattahoochee River, Fulton County, we fished the stream near Connally's Pond. The tributary branch from East Point is polluted. October 15 we found the pond at Connally's with a deep and soft bottom, so could not use a seine. Though individuals were abundant we found few species of fish, but suckers, blue-cats, and black-bass were reported.

*Ameiurus nebulosus* (Le Sueur). Six examples secured, the largest 78 mm., though others much larger were seen. Most were mottled with dusky, and represent *Pimelodus marmoratus* Holbrook, while others partly to nearly uniform.

*Abramis crysoleucas* (Mitchill). Thirty-seven secured, largest 83 mm. All pale.

*Chaerobryttus gulosus* (Cuvier). Ten examples, largest 64 mm. Common.

*Lepomis megalotis* (Rafinesque). Ten secured, largest 113 mm. Common and pale.

*Lepomis incisor* Valenciennes. Three.

(5). Also on October 15 we visited Pea Vine Creek, near Atlanta, Fulton County. This is largely a depleted stream, quite rocky, and with many attractive pools. Below the waters are greatly polluted with sewage.

*Campostoma anomalum* (Rafinesque). Nine, largest 70 mm.

*Semotilus atromaculatus* (Mitchill). Seven, largest 71 mm. One with deformed snub-nosed muzzle.

(6). October 14 we visited Cedar Creek, tributary to the Coosa River at Van's Valley, in Floyd County. We first examined this beautiful stream several miles below Rome, and found it rather rapid and the water greenish in color. Shallows occur in places, with riffles and little falls every span of a hundred yards or more. It was a difficult and hard day along the banks of thick vegetation, we working to Van's Valley and finally to Cave Springs.

*Notropis stigmaturus* (Jordan). An adult 78 mm. long and two young. Though reported abundant at Rome as "spot-tail" we only saw the above and a few examples in the deep pools of Cedar Creek. The young may be distinguished from those of the following

species by the larger black blotch, similar to that of the adult.

*Notropis callistius* (Jordan). Forty-one examples.

*Notropis cornutus* (Mitchill). Four young.

*Notropis chrosomus* (Jordan). Five examples. In alcohol the largest shows an orange band above adjoining the dusky median band. Iris silvery-white, with slight rosy-purple tint.

*Catostomus nigricans* (Le Sueur) Four young.

*Boleosoma stigmaeum* (Jordan).

Head  $3\frac{1}{2}$  to  $3\frac{3}{5}$ ; depth  $5\frac{2}{3}$  to  $6\frac{1}{2}$ ; D. IX—1, 11; A. II, 9; scales 42 in lateral line to caudal base and 2 more on latter; tubes in l. l. 23 to 32; 5 scales above l. l., 5 below; predorsal scales 8; snout  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in head; eye  $3\frac{1}{4}$  to 4; maxillary  $3\frac{1}{2}$  to  $3\frac{2}{3}$ ; interorbital  $1\frac{4}{5}$  to 2 in eye. Body elongate, slender, but slightly compressed. Head well compressed. Muzzle rather short, length  $\frac{7}{8}$  its width. Eye large elevated. Mouth small, lower jaw slightly included. Maxillary not quite to eye, but little protractile. Interorbital narrow. Opercular spine moderately large. Gill-membranes deeply cleft, but slightly connected. Scales on opercles, head otherwise naked. Breast and predorsal naked. Scales with 9 or 10 basal marginal striae, apical denticles 19 or 20, rather large, with three series of basal elements, and circuli large. Caudal slightly emarginate. Color in alcohol pale brownish tessellated or speckled with deep brown to dusky above. About nine w-like marks of dusky close along and below lateral line. Six dark saddles down middle of back. Dorsals and caudal finely barred with dusky. Dusky streak from eye to snout tip and another below eye. Two examples.

This species bears a great resemblance to *Boleosoma nigrum*, though both specimens show two anal spines. In my series of *Boleosoma nigrum* there is usually but a single anal spine. Originally, described with a band of bright orange red above on the spinous dorsal.

*Cottus bairdii* Girard. One 44 mm. This represents the *Potamocottus zopherus* Jordan, or the dark colored southern variety of the Alabama basin.

#### ALABAMA.

(1). We first visited Swan Lake, in Morgan County, October 10. This is a large still body of water, mostly muddy, about a mile long and a few hundred yards in width. During very high water it is connected with the Tennessee River.

*Polyodon spathula* (Walbaum). Tail of a large example examined; caught in the lake.

*Gambusia affinis* (Baird and Girard). Very common.

*Ambloplites rupestris* (Rafinesque). Several.

*Chaenobryttus gulosus* (Cuvier). Three secured. A common species.

*Lepomis incisor* Valenciennes. Thirteen. Very common.

*Micropterus salmoides* (Lacépède). Several examples, 2½ to 3 pounds, caught with plugs.

(2). In the Tennessee River above Albany, October 11, we found:

*Lepisosteus ossesus* (Linné). Saw portions of an adult example at the ship-yard.

*Ictalurus punctatus* (Rafinesque). Several of about two pounds.

*Notropis umbratilis* (Girard). Ten young examples, brilliant silvery in life, seined along the river.

*Stizostedion canadense* (Griffiths). One adult.

(3). In the ponds along the river, mostly muddy, and about Albany, we found:

*Gambusia affinis* (Baird and Girard). Very common, also the next.

*Lepomis incisor* Valenciennes.

(4). Limestone Creek, at Bellemina, Morgan County, October 12. This tributary of the Tennessee River is sluggish and rather muddy, shallow in places and with a bottom of small stones and pebbles. In pools left by floods or high water, we found many small fish entrapped. The riffles were all shallow and gradual, though shallow places scarce and hard to reach.

*Ameiurus natalis* (Le Sueur). Two, larger 67 mm.

*Campostoma anomalum* (Rafinesque). Thirteen. Small and dark.

*Hybognathus nuchalis* Agassiz. One 86 mm.

*Pimephales notatus* (Rafinesque). Eleven.

*Ceratichthys vigilax* Baird and Girard. Three examples.

*Notropis coccoegenis* (Cope). Twenty-four.

*Notropis umbratilis* (Girard). Eleven. This would be *Notropis umbratilis fasciolaris* Gilbert, though my examples differ in their normal slender body and absence of five to eight dark blue, vertical, cross-bars.

*Hybopsis amblops* (Rafinesque). Thirteen.

*Minytrema melanops* (Rafinesque). Five. Though the largest example is only 90 mm. long, most show the dorsal and anal with brick red tints and the former black apically.

*Moxostoma aurcolum* (Le Sueur). Four, largest 75 mm. All

have five to eight tubular scales in fore part of lateral line. Largest with anal and caudal tinted brick-red.

*Fundulus notatus* (Rafinesque). Three.

*Gambusia affinis* (Baird and Girard). Very abundant.

*Apomotis cyanellus* (Rafinesque). Eleven.

*Lepomis megalotis* (Rafinesque). Four.

*Percina caprodes* (Rafinesque). Four.

*Ulocentra simotera* (Cope). Five.

*Poeciliichthys maculatus* (Kirtland). One. It shows: D. XII—1, 11, A. II, 10; scales in l. l. 52 to caudal base and 3 more on latter.

*Poeciliichthys coeruleus* (Storer). Five.

(5). On October 13 we visited the Paint Rock River at Paint Rock, in Jackson County. This broad stream, tributary also to the Tennessee River, was partly clear, though muddy in places. Below the dam we found a few stony shoals, especially about the fords. A mile below were high banks, where the bottom was largely clay, and only one place with a few submerged aquatic plants. Also, in many places the shoals were full of snags. In most places the only fish were free-swimmers, as we could not drag the shoals on account of the rocks on the bottom.

*Ameiurus natalis* (Le Sueur). Saw one dead example.

*Campostoma anomalum* (Rafinesque). Fourteen examples.

*Pimephales notatus* (Rafinesque). Ten, largest 75 mm.

*Opsopoeodus emiliae* Hay.

Head 4; depth  $4\frac{2}{3}$ ; D. II, 8, 1; A. II, 7, 1; scales 35 in lateral line to caudal base and 2? more on latter; 6 scales above l. l., 4 below; 19 predorsal scales; snout 4 in head from upper jaw tip; eye  $3\frac{1}{5}$ ; maxillary  $4\frac{1}{5}$ ; interorbital  $2\frac{3}{4}$ . Body fusiform, compressed. Head compressed. Muzzle obtuse. Snout depressed, length  $\frac{2}{3}$  its width. Eye large, greater than snout, less than interorbital. Mouth small, cleft less than pupil, vertically oblique, mandible well protruded and snout tip level with upper part of pupil. Interorbital broadly convex. Predorsal scales little crowded, somewhat narrowly imbricated along side of trunk, moderate on breast, apical radiating striae 6 or 7, circuli coarse. Dorsal inserted little nearer snout tip than caudal base, first branched rays depressed back much further than last. Color in alcohol very pale olivaceous above, sides and below silvery-white. Dusky lateral band, made up of black dots, on preorbital and opercle to caudal base, where ending in slight dusky spot, width much less than pupil. Fins all pale, with dusky dots along bases of dorsal and anal and row down predorsal. Length 48 mm.

Besides the above I examined another example in the Academy,

53 mm. long from Beaumont, Texas. Head  $4\frac{1}{10}$ ; depth 4; D. II, 8, 1; A. II, 7, 1; scales 37 in lateral line to caudal base and 2 more on latter; 7 scales above l. l., 4 below; 21 predorsal scales; head width  $1\frac{3}{4}$  in its total length; snout  $3\frac{1}{5}$ ; eye  $3\frac{1}{5}$ ; maxillary 4; interorbital  $2\frac{2}{7}$ ; teeth 5—5.

Not common. An interesting little fish, and is easily distinguished among our cyprinoids by its very small mouth and strongly projecting lower jaw. Not previously known from the Tennessee River basin.

*Ceratichthys vigilax* Baird and Girard. Four small examples.

*Notropis boops* Gilbert. Two examples, largest 55 mm. These specimens I questionably place with this species. They are greatly like *Hybopsis amblops* of equal size, though without any grinding surfaces, or only with slightly or irregular transverse grooves suggestive of crenulations.

*Notropis whipplii* (Girard). Seven examples, largest 60 mm.

*Notropis coccogenis* (Cope). Ten, largest 73 mm.

*Notropis telescopus* (Cope). Thirty-one.

*Notropis umbratilis* (Girard). Very abundant.

*Hybopsis dissimilis* (Kirtland). Twenty-two examples, largest 84 mm. Only met with in schools, at the ford, in open shallow water. The species appears to collect in schools of moderate size, and mostly composed of individuals of uniform size.

*Hybopsis amblops* (Rafinesque). Twenty-two.

*Cutostomus nigricans* (Le Sueur). Three young.

*Moxostoma aureolum* (Le Sueur). One young example. Paired fins and dorsal pale orange, tip of latter blackish.

*Fundulus catenatus* (Storer). Adult male 90 mm. long. Associated with *Hybopsis dissimilis*.

*Fundulus notatus* (Rafinesque). Two.

*Labidesthes sicculus* (Cope). Ten.

*Lepomis megalotis* (Rafinesque). One 40 mm.

*Micropterus dolomieu* (Lacépède). One young.

*Etheostoma blennioides* Rafinesque. One 52 mm.

*Ulocentra simotera* (Cope).

Head  $3\frac{5}{8}$  to 4; depth  $5\frac{1}{4}$  to  $5\frac{1}{3}$ ; D. X—I, 9 or I, 10; A. II, 7; scales 42 to 48 in lateral line to caudal base, and 3 more on latter, though only one tubular; 4 or 5 scales above l. l. to spinous dorsal origin, 7 below to spinous anal origin; 10 to 12 predorsal scales; snout  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in head; eye 3 to  $3\frac{1}{3}$ ; maxillary 4 to  $4\frac{1}{4}$ ; interorbital  $1\frac{1}{3}$  to  $1\frac{1}{2}$  in eye. Body elongate, compressed moderately, heavier



forward. Head moderate, greatly obtuse. Snout obtusely convex, both in profile and over surface, length  $\frac{7}{8}$  its width. Eye anterior to head center, elevated. Mouth small, but little inclined, lower jaw slightly included. Maxillary reaches eye. Interorbital slightly concave. Gill-rakers 2 + 7, lanceolate, short. Gill-membrane a broad fold over isthmus. Cheeks and breast naked, opercles scaly. Predorsal scales small and crowded. Scales with 10 basal radiating striae, apical denticles 23 or 24, with basal elements in 3 to 5 rows, circuli coarse. Color in alcohol pale olivaceous above generally. Down back medially nine dark brown saddles, usually alternately dark and pale. Back marked with many waved, dusky specks, bars or blotches. Along lateral line twelve vertical blotches, mostly below. Upper surface of snout speckled with dark brown, bounded below by dusky bar from close to snout tip, though above upper lip, to eye. Broader dusky bar below eye. Dorsal spines each with five broad dusky blotches, last four on membranes usually with blackish streaks parallel with spines terminally. Soft dorsal and caudal barred with dusky. Pectoral pale or only with faint bars. Five examples, 38 to 45 mm.

*Boleosoma nigrum* (Rafinesque). Ten, all small and pale.

*Poccilichthys maculatus* (Kirtland).

Head  $3\frac{1}{5}$  to  $3\frac{2}{5}$ ; depth  $5\frac{3}{4}$  to 6; D. XII—1, 11; A. II, 8 or 9; scales 46 to 53 in median lateral series to caudal base, and 3 or 4 more on latter; 38 to 41 tubular scales in lateral line, 6 above, 6 or 7 below; predorsal scales 12 or 13; snout  $3\frac{1}{2}$  to 4 in head; eye  $3\frac{1}{3}$  to  $3\frac{7}{8}$ ; maxillary  $3\frac{1}{4}$  to  $3\frac{1}{3}$ ; interorbital 2 to  $2\frac{1}{8}$  in eye. Body long, slender, but little compressed. Snout convex, both in profile and over surface, pointed, about long as wide. Eye advanced, elevated, nearly or quite long as snout. Mouth but slightly inclined, mandible included. Maxillary slightly beyond front eye edge. Interorbital narrowly concave. Gill-rakers 2+9, rather short, obtuse. Gill-membranes deeply cleft. Cheeks and breast naked, postocular and opercles scaled. Predorsal scales reduced. Scales with basal radiating striae 10 or 11, apical denticles 21 to 24, with basal elements in 3 or 4 rows. Lateral line incomplete, usually not extending beyond soft dorsal, occasionally to middle of caudal peduncle side. Color in alcohol, pale olivaceous above, with six dark saddles down middle of back. Scales on back more or less bordered dusky or brown. Along sides ten or eleven w-like dusky blotches. At caudal base medianly jet-black blotch, about size of pupil. Dorsals and caudal barred with dusky. Broad dusky bar on side of snout to eye, also dusky blotch below and behind eye. Paired fins and anal pale or whitish, few dusky specks close about base of latter. Six examples, 35 to 45 mm.

The Bellemina example, with ten branched anal rays is greatly suggestive of *Etheostoma tessellata* Storer<sup>3</sup>. Quite likely *Etheostoma*

<sup>3</sup> Proc. Boston Soc. Nat. Hist., 2, 1845, p. 48. Florence, Alabama.

*cinereum* Storer<sup>4</sup> is another synonym.

According to the original account of *Etheostoma maculata* Kirtland, the dorsal fins are connected and the anal has only a single spine<sup>5</sup>.

*Poecilichthys squamiceps* (Jordan).

Head  $3\frac{3}{4}$ ; depth 5; D. XI—1, 11; A. II, 8; scales 51 or 52 in lateral line to caudal base and 3 more on latter; 5 scales above l. l., 7 below; predorsal scales 11 or 12; snout  $4\frac{1}{4}$  to  $4\frac{1}{3}$  in head; eye 3 to  $3\frac{2}{5}$ ; maxillary  $3\frac{3}{4}$  to 4; interorbital  $1\frac{3}{4}$  in eye. Body moderately long, compressed. Head obtuse, compressed. Snout convex in profile and over surface, length  $\frac{4}{5}$  its width. Eye elevated, well advanced, greater than snout or interorbital. Mouth little inclined, small, jaws nearly even. Maxillary reaches eye. Interorbital shallowly concave. Gill-rakers 3 + 8, lanceolate, moderate. Gill-membranes broadly free across isthmus. Cheeks and opercles scaly. Breast naked. Belly scaled and predorsal scales fine. Scales with 7 to 9 radiating coarse striae, apical denticles 16 or 17, large, basal elements in 3 or 4 rows. Lateral line complete. Color in alcohol pale olivaceous above, under surface white. Down middle of back, six deep brown blotches. Along lateral line, ten dusky rings with dark bar from lower edge of each, some reaching anal and others extending over lower surface of caudal peduncle. Small blackish spot at caudal base medially, one above and another below marginally or at origin of each lobe. Deep dusky brown line from snout tip, meets its fellow above upper lip, to eye. Blackish bar below eye and blotch close behind. Maxillary end dusky and dusky bar across mandible medianly. Dorsals and caudal barred with dusky, other fins pale. Length 38 or 39 mm., two examples.

No mention seems to have been made, by the various writers supposed to have obtained this species, of the dark color pattern extending to the anal base and on the lower surface of the caudal peduncle. My examples appear to agree best with the original account of *Etheostoma squamiceps* Jordan.<sup>6</sup>

<sup>4</sup> L. c., p. 49. Florence, Alabama.

<sup>5</sup> Boston Journ. Nat. Hist., 3, 1840, p. 276 Pl. 2. fig. 3. Mahoning, Ohio.

<sup>6</sup> Bull. U. S. Nat. Mus., No. 10, 1877. p. 11. Russellville, Kentucky.

## EXPLANATION OF PLATES I, II.

The line accompanying each figure represents ten millimeters.

PLATE I.—*Notropis brimleyi* B. A. Bean. *Notropis scepticus* (Jordan and Gilbert).

*Hybopsis rubrifrons* (Jordan).

*Notropis cerasinus* (Cope). *Notropis lutipinnis* (Jordan and Brayton).

PLATE II.—*Poecilichthys inscriptus* (Jordan and Brayton). *Boleosoma sigmaeum* Jordan.

*Catostomus rhothoecus* Jordan and Evermann.

*Poecilichthys maculatus* (Kirtland). *Poecilichthys squamiceps* (Jordan).